CLAIMS

1. A method of moving droplets, comprising:

providing a liquid phase on a surface;

dispensing a droplet into the liquid phase, the liquid phase being immiscible with the droplet; and

focusing a beam of light at an edge of the droplet in the liquid phase to produce a thermal gradient sufficient to induce the droplet to move.

2. The method of claim 1, wherein the droplet forms a contact angle approaching 180° with respect to the surface.

3. The method of claim 1, wherein the beam of light contacts the droplet.

4. The method of claim 1, wherein the beam of light passes near without contacting the droplet.

5. The method of claim 1, wherein the immiscible liquid phase includes an organic liquid.

6. The method of claim 5, wherein the organic liquid includes decanol.

7. The method of claim 1, wherein the immiscible liquid phase controls evaporation of the droplet.

8. The method of claim 1, wherein the immiscible liquid phase comprises a first immiscible liquid and a second immiscible liquid, the second immiscible liquid having a greater density than that of the first immiscible liquid and of the droplet to produce a fluid-to-fluid interface between the immiscible liquids upon which the droplet sits.

9. The method of claim 8, wherein the second immiscible liquid includes perflourinated silicone oil.

10. The method of claim 1, wherein the thermal gradient forms within the droplet.

11. The method of claim 1, wherein the thermal gradient forms in the immiscible liquid phase.

12. The method of claim 1, wherein the droplet is aqueous.

13. The method of claim 1, wherein the beam of light includes an infrared wavelength.

14. The method of claim 1, further comprising inserting dye into one of the droplet and the immiscible liquid phase to cause optical absorption by molecules of the dye.

15. The method of claim 1, wherein a size of the droplet ranges from approximately 30 μm to 1500 μm in diameter.

16. The method of claim 1, wherein the droplet is a first droplet, and further comprising depositing a second droplet into the immiscible liquid phase and moving the first droplet into the second droplet to cause the droplets to fuse and contents of the droplets to mix.

17. The method of claim 16, wherein each droplet contains a chemical fragment.

18. The method of claim 16, further comprising detecting a biological molecule in the fused droplet.

19. The method of claim 16, further comprising detecting a gene in the fused droplet.

20. The method of claim 16, further comprising detecting products of gene expression of a particular gene.

21. The method of claim 1, further comprising turning the light beam on and off to perform thermal cycling of the droplet.

22. An apparatus for moving droplets, comprising:

a surface;

a droplet on the surface;

a light source producing a focused beam of light;

means for directing the beam of light at the droplet disposed on the surface to heat the droplet and cause a thermal gradient to form across the droplet sufficient to induce the droplet to move across the surface.

23. The apparatus of claim 22, further comprising a liquid phase on the surface, the liquid phase being immiscible with the droplet, and wherein the droplet is surrounded by the immiscible liquid phase.

24. The apparatus of claim 23, wherein the immiscible liquid phase comprises a first immiscible liquid and a second immiscible liquid, the second immiscible liquid having a greater density than that of the first immiscible liquid and of the droplet to produce a fluid-to-fluid interface between the immiscible liquids upon which the droplet sits.

25. The apparatus of claim 24, wherein the second immiscible liquid includes perflourinated silicone oil.

26. The apparatus of claim 23, wherein the immiscible liquid phase includes an organic liquid.

27. The apparatus of claim 26, wherein the organic liquid includes decanol.

28. The apparatus of claim 22, where the beam of light includes an infrared wavelength.

29. The apparatus of claim 22, wherein the droplet is aqueous.

30. The apparatus of claim 22, wherein the droplet includes a dye to cause optical absorption by the droplet.

31. The apparatus of claim 22, wherein a size of the droplet ranges from approximately 30 μm to 1500 μm in diameter.

32. The apparatus of claim 22, further comprising a second droplet on the surface and wherein the directing means causes one of the droplets to move into the other of the droplets, causing the droplets to fuse and contents of the droplets to mix.

33. The apparatus of claim 32, wherein each droplet contains a chemical fragment.

34. The apparatus of claim 32, further comprising means for detecting a biological molecule in the fused droplet.

35. The apparatus of claim 32, further comprising means for detecting a gene in the fused droplet.

36. The apparatus of claim 32, further comprising means for detecting produces of gene expression of a particular gene.